REMARKS

Claims 66-155 are in the application. Each of these claims is amply supported in the application, and each is directed to one or more features that distinguish the over the cited art as detailed below:

Claims 66-74: *Concave/convex mirror system used for slit-to-detector relay optics*. This type of mirror system is useful for spectral imaging for semiconductor applications. Compared to other mirror relay lenses used in other imaging spectrometers, it is simpler and it lacks an integrated diffracting element.

Claims 75-86: *Multiple sensors*. These claims are directed to overcoming the problem of obtaining high resolution (i.e., a large number of pixel columns) over a large area by using multiple sensors. It is described on page 16 of the specification

Claims 87-89: *Determining a process time of a semiconductor manufacturing process*. The specification on page 9 refers to the advantages the claimed system offers for making rapid, in-line film thickness measurements. In-line measurements are well known in the semiconductor industry in the context of run-to-run process control, where post-process film thickness measurements are needed for adjusting process parameters such as the process time of a manufacturing process step. However, existing techniques are slow for the same reasons that stand-alone metrology tools are slow. The 1-D scanning technology of the claimed system circumvents these slow speeds, and offers enhanced measurement flexibility since relatively large portions of a wafer can be imaged and then measured.

Claims 90-92: *Finding the notch with the 1D scanning image*. Many semiconductor processing steps require that the wafer orientation be found. This is usually done by physically rotating the wafer in a dedicated "notch aligner" until the notch is optically detected. In these claims, the notch and thus the wafer orientation are found by examining the image of the wafer generated by the imaging system. The description is found on page 17.

Claims 93-102: *Forming a two-dimensional map of a film property.* These claims describe how to determine film property values from a two-dimensional spectral image, resulting in an array of film property values corresponding to a portion of a wafer. The 1-D scanning technology of the claimed system enhances overall throughput due to its speed and design. The high speed addresses throughput requirements, and the ability of 1-D imaging technology to measure the reflectance of portions of a wafer allows greater flexibility in where measurements can be made in a limited amount of time. The description is found on pp. 16 – 17.

Claims 103-120: *On-tool 1D scanning measurements using existing transfer mechanisms for motion.* These claims recite a 1-D scanning method that requires relative motion between the imager and the sample being measured, and that takes advantage of the fact that in many semiconductor processing equipment there exists a mechanism for transferring wafers between various storage and processing stations. The claimed method uses this pre-existing transfer mechanism for moving the wafer relative to the imager, thus saving the space and expense of a dedicated scanning stage. These claims are supported in the discussion of the embodiment beginning on pg. 8.

Claims 121-134: *Generalized claims*. These claims describe how to use 1-D scanning to measure film properties using semiconductor processing equipment. The specification describes this technique in considerable detail with respect to CVD processes, and it clearly describes the applicability of 1-D scanning to other process equipment in general. The small footprint, high speed, and simplicity of design means that 1-D scanning technology can be fitted to any of a variety of semiconductor processing equipment. Specific reference is made to CVD processes on pg. 8, and to other semiconductor processing equipment on pg. 9.

Claims 135-146: *On-tool 1D scanning measurements through a viewport.* These claims are directed to a 1-D scanning system that has a much longer focal length and smaller numerical aperture compared to the microscope-based systems, which are referenced in the Background section. This allows the system to be used more effectively when imaging through viewports, as described in the embodiment beginning on pg. 8.

Claims 147-155: *Using a commercially available TDI line-scan camera modified to operate in area scan-mode to provide the aspect ratio and speed required for the application.* Solid-state imagers can classified into to categories: 1) line-scan cameras, which are used to image a series of one-dimensional images (as their name implies), and 2) area-scan cameras, which are used to image two-dimensional images. These claims are directed to a system providing high-speed operation from an imager with pixels arranged in 1000-to-4000 rows by 32-to-96 columns. Applicant is not aware of any commercially available area-scan cameras that fit this need. To solve this problem, the claimed system includes the use of a "time delay and integration" line scan camera (which has the required speed and pixel arrangement) that had been modified to work in area-scan mode. Such a camera is not commercially available, but was custom-made by the applicant. This custom camera was a modified Dalsa CT-E4-2048, as described in the first example on page 10.

Respectfully submitted,

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